



Diversity of Life Card Game

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Summary:

The *Diversity of Life Card Game* is a fun and educational activity with a surprise twist at the end. It is designed to be led by a museum educator, docent, or volunteer working with small groups of 2-5 people within the Alien Earths traveling museum exhibit. We recommend using it in the "Search for Life" section of the Alien Earths exhibit. It can also be used by parents and teachers as an excellent stand-alone activity in any setting.

Learning Objectives:

Learners will come away with an understanding that:

- o Life on Earth is extremely diverse
- o Organisms can BE habitats
- o Microbes make up most of the life on Earth
- o When searching for life on Earth or other planets, the methods we use determine what kinds of things we are able to find

Length: 5-9 min

Ages: 7 & Up

Materials You Will Need:

- o **Table** (chairs optional)
- o **Picture Cards:** These are included at the end of this document under "Full Size Images for Cards." Simply print and then cut out. We recommend laminating the picture cards.
- o **Glo-Germ Powder:** Order from www.glogerm.com, 4oz jar of powder costs \$12.95 and will last for hundreds of card games. NOTE: Glo-Germ is hypoallergenic
- o **UV Light:** Order from www.glogerm.com for \$25.95 and up (any UV black light will do, cheaper ones may be found at other stores)
- o **Paper-Towels** and/or hand-wipes for clean-up

Key:

Italicized Text is suggested script

? Indicates important questions to pose to learners

LG Indicates a key learning goal to emphasize

Diversity of Life: Facilitator's Quick Reference Outline A One-Page Activity Guide

Introduction

Imagine, you are an astrobiologist from an alien world...

1. Divide the cards into two piles (1-2 min)
 - o Living things (organisms) and
 - o Places where they live (habitats)

2. Match the organisms with their environments (2-3 min)

LG Organisms are diverse and can live in many environments. Organisms can BE habitats for other organisms.

3. Introduce Microbes Challenge Card (1 min)

? *Do you know what these are?* Microbes.
? *How big are they?* Microscopic.

4. Introduce Supplementary Cards: hot springs, dry valley, deep sea vents, plate of food
? *Which of these is the habitat for microbes?* All are.
LG Microbes live in many habitats, even extreme ones. Microbes make up most of the life on Earth.

5. Introduce Mars Challenge Card (1 min)

? *What is this?* Mars.
? *Does anything live here?* Maybe. We don't know.
? *What kind of life might live here?* Probably microbes.
? *How would we look for such life there?* Atmosphere, landers, rovers, sample return.
LG Life changes the physical environment. Microbes and other life have planet transforming potential. We look for the changes they cause.

6. Introduce Alien Challenge Card (1 min)

? *How would we find this kind of alien?* Searching for signals. Introduce Radio Telescope Card
LG What kind of search we conduct determines what we are able to find.

7. Seeing the Unseen (1 min)

For example, I put pretend microbes on the cards. We can see them, by searching with this special light...

Facilitator's Complete Instructions

Pre Activity Preparations:

- o Set up a table in the Alien Earths exhibit. We suggest placing it near the “Search for Life” area.
- o Sprinkle the Glo-Germ powder on the image cards (a little goes a long ways). We suggest keeping laminated cards in a zip-lock bag, sprinkling the powder inside and then shaking it up. Be careful not to overdo it as the activity is best if learners do not notice the powder. Also keep in mind that you will need to re-apply the powder from time to time.
- o Be sure your UV black light has fresh batteries.

Vocabulary:

Microbes and microorganisms:	An organism of microscopic or submicroscopic size, especially a bacterium or protozoan.
Environment:	The totality of circumstances surrounding an organism or a group of organisms.
Extreme environment:	A subjective term for an environment that is considered to be at the fringe of habitability or is uninhabitable, depending on what kind of life form is being considered.
Habitat:	The specialized area or type of environment in which an organism or ecological community normally lives or occurs
Adaptation:	An alteration or adjustment in structure or behavior, often hereditary, by which a species or individual improves its chances of survival in its environment.
Diversity:	Variety or multiformity

Introduction:

Imagine, you are an astrobiologist from an alien planet. That is someone who studies life on other worlds. You have been studying the planet known as Earth in order to classify its many forms of life. See if you can use your data (these images) and discover some new facts about Earth life.

Step 1. Have the learners divide the cards into two piles (1-2 min)

- o Living things (organisms) and
- o Places where they live (habitats)

Feel free to give information about what the images are, but leave this part of the activity fairly open-ended, with very little emphasis on right and wrong. The point is to stimulate thinking about living things and their environments.

Step 2. Match the organisms with their environments (2-3 min)

This section of the activity asks learners to think more critically about the organisms and their environments. Have them match cards from one pile with cards of another. There may be more than one correct answer (if you have some imaginative learners). Again, place little emphasis on right and wrong, but rather focus on the process of thinking it through. To facilitate this, feel free to pose additional questions designed to guide learner inquiry, such as:

What would an organism need to live in this habitat?

What are some characteristics of this environment? Is there a lot of water? Food? Light?

What can this organism do? How does it survive?

Learning Goal for steps 1 & 2: Organisms are diverse and can live in many environments. Organisms can BE habitats for other organisms (example: the flea lives on the dog)

Step 3. Introduce Microbes Challenge Card (1 min)

? Do you know what these are? Microbes.

? How big are they? Microscopic.

When you introduce the microbes card, you may need to define microbes or micro-organisms as living things that are too small to see with the unaided eye.

Step 4. Introduce Supplementary Challenge Cards:

hot springs, dry valley, deep sea vents, food plate

? Which of these is the habitat for microbes? All are.

When you pose this question, let the learners ponder it. You may have to define and describe the environments. Again, pose additional questions to guide learner inquiry.

Hot Springs: Pools of extremely hot water, geothermally heated inside the Earth and often containing high concentrations of minerals

Desert: Dry valley environment with little or no rain-fall

Deep Sea Vents: Locations on the ocean floor where extremely hot water and gas escape from inside the Earth. These vents are under tens of thousands of pounds of pressure and are always in darkness (no sunlight).

Plate of Food: Obvious

Learning Goal for Step 3: Microbes live in many habitats, even extreme ones. Microbes make up most of the life on Earth.

Step 5. Introduce Mars Challenge Card (1 min)

? *What is this?* Mars.

? *Does anything live here?* Maybe. We don't know.

? *What kind of life might live here?* Probably microbes, if anything.

? *How would we look for such life there?* Life-chemicals in the atmosphere, look for signs of water, use landers, rovers, return some Mars rocks and soil samples to the Earth.

Learning Goal: Life changes the physical environment. Microbes and other life have planet transforming potential. We look for the changes they cause.

Step 6. Introduce Alien Challenge Card (1 min)

? *How would we find this kind of alien?* (note: this card shows what we commonly think of when we think about intelligent aliens). Searching for their signals.

Introduce Radio Telescope Card

We are looking for alien signals using radio telescopes like this. These telescopes can only find radio signals, they cannot detect light in the visual spectrum and produce the pretty images we've all seen from the Hubble Space Telescope. They detect radio waves from space.

Learning Goal: What kind of search we conduct determines what we are able to find.

Step 7. Seeing the Unseen (1 min)

In both astronomy and biology, we cannot always see the things we are looking for and must use special detection tools. The tools we use determine what kinds of things we are able to find – just like using radio telescopes to search for alien signals.

For example, I pulled a fast one on you put some pretend microbes on these cards – you may have noticed a little powder on them? Well these pretend microbes are hard to see, but we can see them by searching with this special light.

Use the UV light to look at their hands and arms, even clothing or wherever else they might have touched, or scratched during the last 5 minutes.

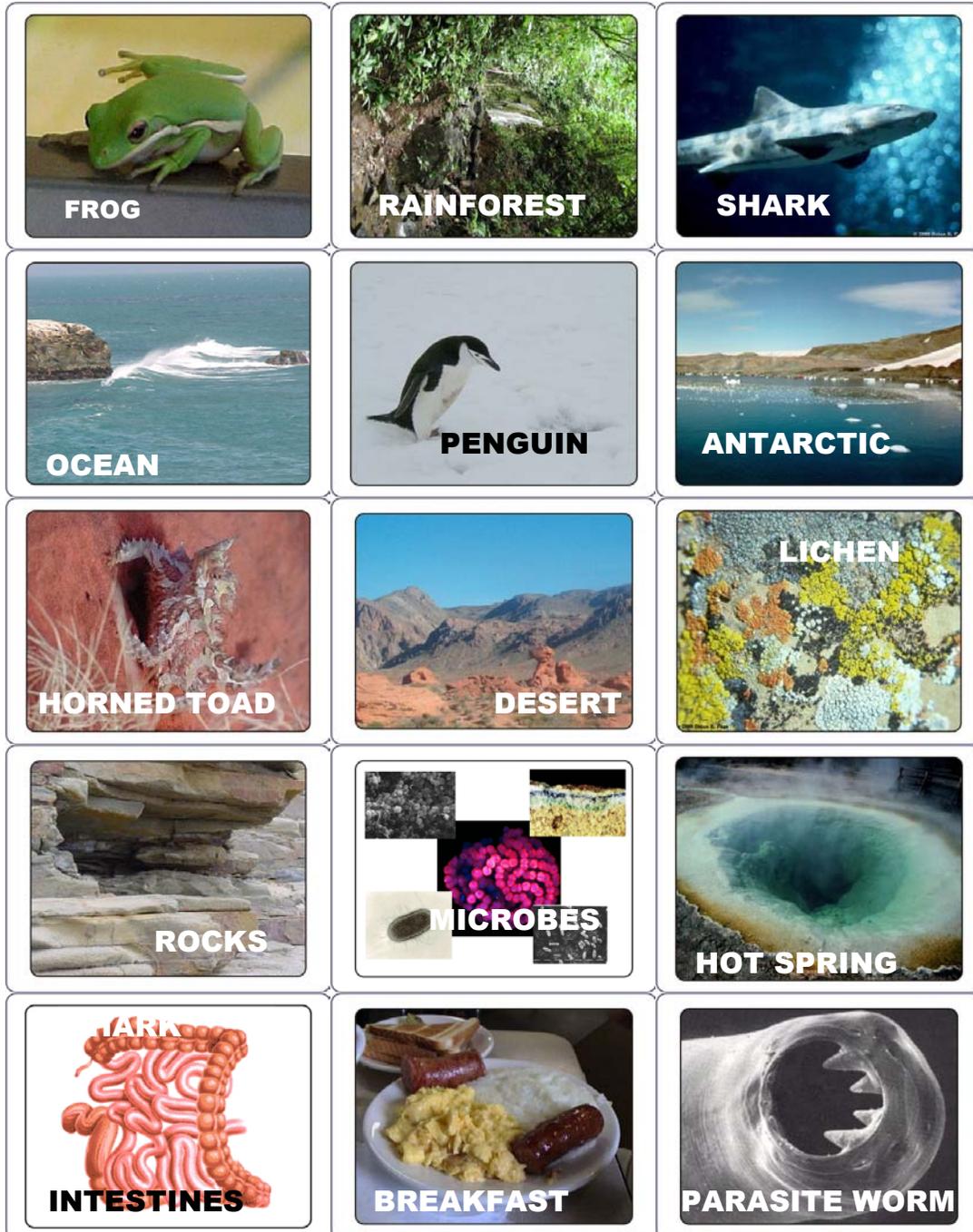
NOTE: if you shine the UV light on their faces, be sure they close their eyes first.

Conclude with passing out some hand-wipes for clean-up.

And now you know why we wash our hands even when they don't appear to be dirty – microbes are too small to see with our eyes!

Picture Card Image Map

These miniature images tell you what each card shows. The larger print-and-cut-out images are in the last section.



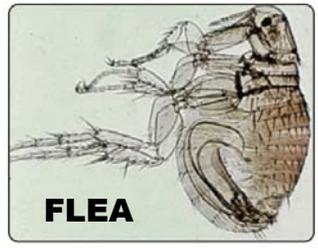
***Microbes (and their environments) are, clockwise from upper left:**
Sulfur-loving bacteria, Antarctic lichen (rocks), Thermophile bacteria (hot spring), E. coli bacteria (food, intestine), Cyanobacteria (ocean)



MOUNTAIN



ELK



FLEA



DOG



BUTTERFLY



GREEN PEPPER



FLOWERS



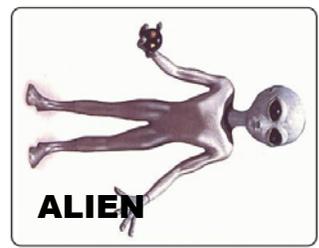
TUBE WORMS



EAGLE



ASPEN TREES



ALIEN



RADIO TELESCOPE



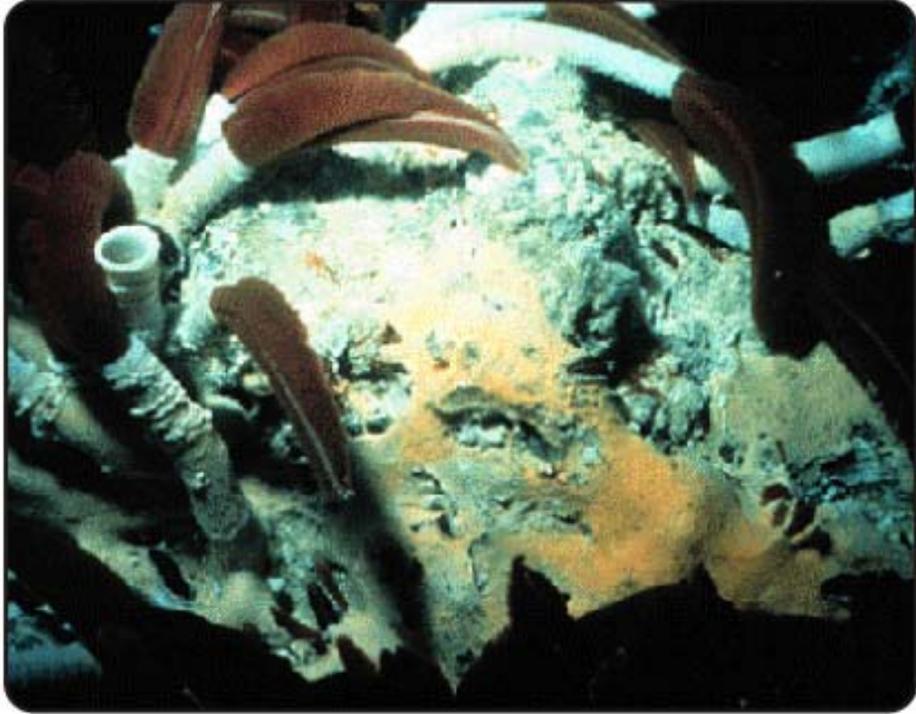
MARS



DEEP SEA VENT

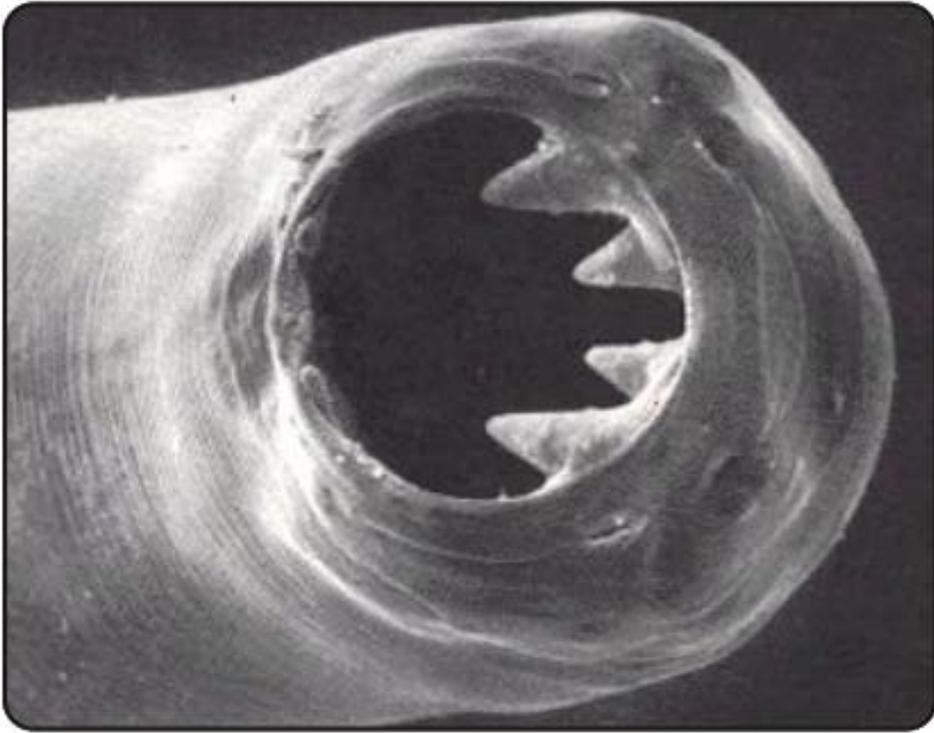
Full Size Images for Cards

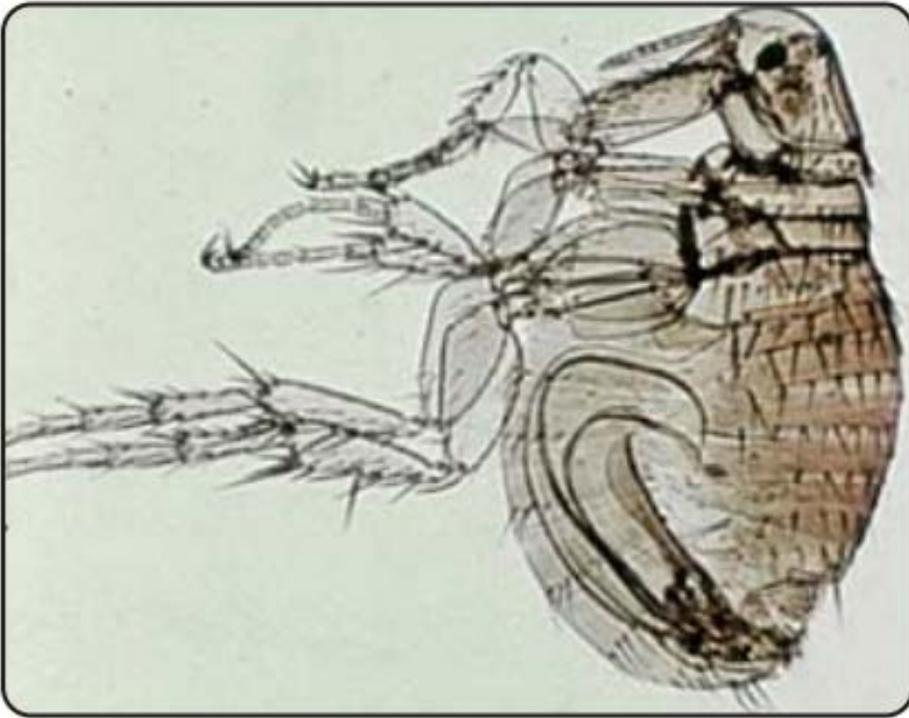






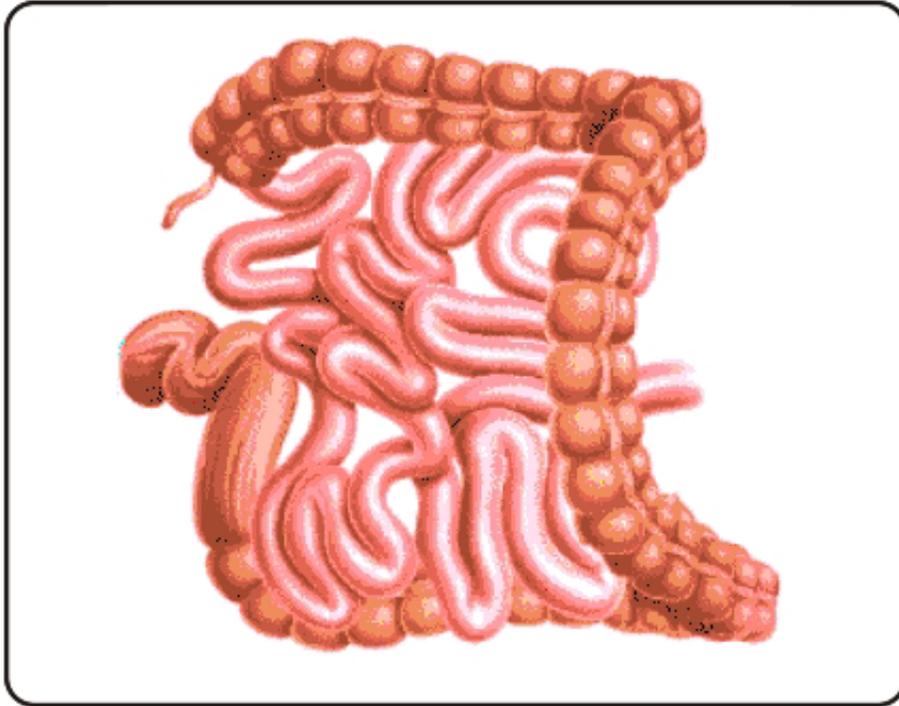
















Challenge Cards

